

**4.NF.1** Explain why a fraction  $a/b$  is equivalent to a fraction  $(n \times a)/(n \times b)$  by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.

### Mechanics

*Teacher Notes: This standard builds upon the NF standards addressed in grade 3, especially 3.NF.3. Students should use fraction models, number lines, and/or manipulatives to explore equivalent fractions with denominators of 2, 3, 4, 5, 6, 8, 10, 12, and 100.*

Students should understand these concepts:

- Two fractions can be equal even though “the number and size of the parts differ.”
- Equivalent fractions can be made by multiplying the numerator and denominator by the same number.

### Examples:

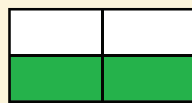
A) What fraction of the rectangle is shaded?

Answer: one-half



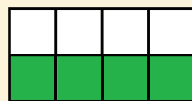
B) What fraction of the rectangle is shaded?

Answer: two-fourths



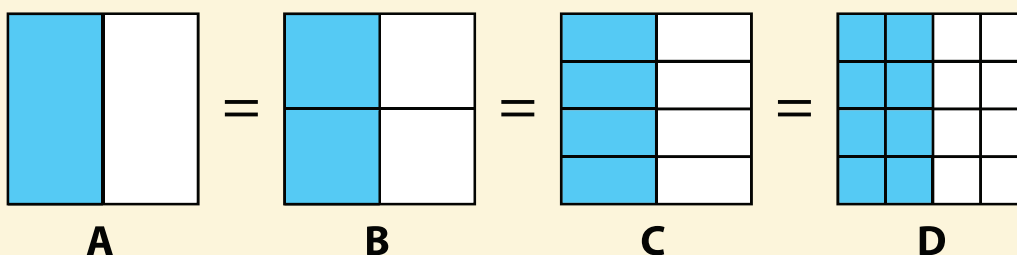
C) What fraction of the rectangle is shaded?

Answer: four-eighths



These fractions are called **equivalent** because they are the same size. There are more parts in  $\frac{4}{8}$  than there are in  $\frac{2}{4}$ , but the whole rectangle is the same size, and the shaded area is the same size in both rectangles.

Study these equivalent fractions:  $\frac{1}{2} = \frac{2}{4} = \frac{4}{8} = \frac{8}{16}$



What do you notice about the numerators and denominators? Let's look again:

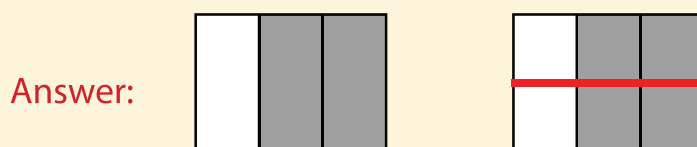
$\frac{1}{2} \times \frac{2}{2} = \frac{2}{4}$  and  $\frac{2}{4} \times \frac{2}{2} = \frac{4}{8}$       What is the product?  $\frac{1}{2} \times \frac{4}{4} = \frac{2}{2}$       Answer:  $\frac{4}{8}$

Why did we multiply the numerator and the denominator by 4?

Possible Answers: Rectangle C has 4 times as many parts as rectangle A, but the shaded area is the same. OR Any number times 1 (in this case in the form of  $\frac{4}{4}$ ) equals the same number.  $\frac{1}{2} \times \frac{4}{4} = \frac{4}{8}$  (equivalent to  $\frac{1}{2}$ )

Use a fraction model to show that  $\frac{2}{3}$  is equal to  $\frac{4}{6}$ .

First, draw a fraction model. Show two-thirds. Then, draw a line to show four-sixths.



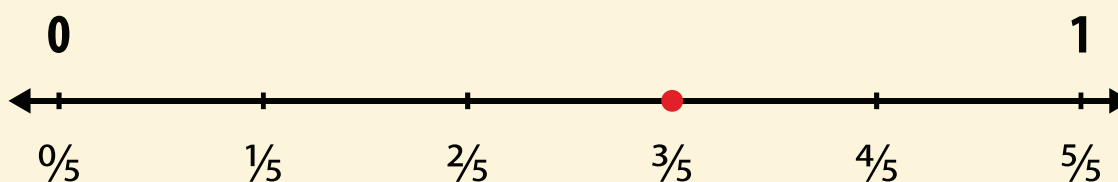
Write a multiplication sentence. Answer:  $\frac{2 \times 2}{3 \times 2} = \frac{4}{6}$

Make sure students understand that the equation means the same whether written as

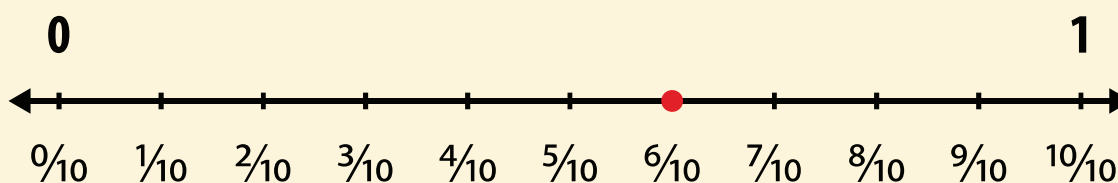
$\frac{2 \times 2}{3 \times 2} = \frac{4}{6}$  or as  $\frac{4}{6} = \frac{2 \times 2}{3 \times 2}$ .

Use a number line to show that  $\frac{3}{5}$  is equal to  $\frac{6}{10}$ .

Draw a number line that goes from zero to one. Show fifths.



Draw a number line that goes from zero to one. Show tenths.



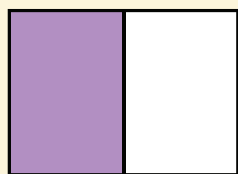
The place on the number line is the same for  $\frac{3}{5}$  and  $\frac{6}{10}$  even though the bottom number line is divided into more parts. Both fractions are the same distance from zero (or at the same spot between zero and one).

Write a multiplication sentence:  $\frac{3 \times \square}{5 \times \square} = \frac{6}{10}$     **Answer:**  $\frac{3 \times 2}{5 \times 2} = \frac{6}{10}$

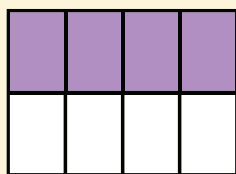
Why do we multiply the numerator and denominator by 2?

**Possible Answers:** The bottom number line is divided into two times as many parts as the top number line. OR Any number times 1 (in this case in the form of  $\frac{2}{2}$ ) equals the same number.  $\frac{3}{5} \times \frac{2}{2} = \frac{6}{10}$  (equivalent to  $\frac{3}{5}$ )

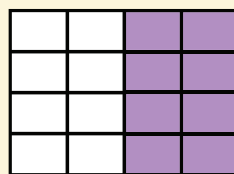
Study the fraction models. Write a fraction for the shaded part of each model.



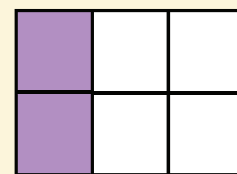
A



B



C



D

**Answers:** A =  $\frac{1}{2}$     B =  $\frac{4}{8}$     C =  $\frac{8}{16}$     D =  $\frac{2}{6}$

Which two models show that  $\frac{1 \times 8}{2 \times 8} = \frac{8}{16}$ ?

**Answer:** A and C

*Note: Improper fractions may also be included in this standard.*

Examples:  $\frac{6 \times 10}{5 \times 10} = \frac{60}{50}$      $\frac{3 \times 8}{2 \times 8} = \frac{24}{16}$      $\frac{12 \times 2}{10 \times 2} = \frac{24}{20}$

### Examples from *Simple Solutions Common Core Math 4*:

Are these fractions equivalent?  $\frac{3}{5}$  and  $\frac{6}{10}$

**Answer:** Yes

Which two fractions are equivalent?  $\frac{10}{5}$      $\frac{9}{10}$      $\frac{3}{2}$      $\frac{6}{4}$

**Answer:**  $\frac{3}{2}$  and  $\frac{6}{4}$

Fill in the numerator or denominator to show an equivalent fraction.

$$\frac{1}{\boxed{2}} = \frac{2}{4}$$


$$\frac{\boxed{8}}{12} = \frac{4}{6}$$

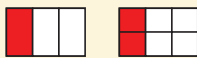
$$\frac{1}{10} = \frac{10}{\boxed{100}}$$

$$\frac{3}{\boxed{4}} = \frac{9}{12}$$

Write two equivalent fractions for  $\frac{2}{3}$ .     $\frac{2}{3} = \frac{\boxed{4}}{\boxed{6}} = \frac{\boxed{6}}{\boxed{9}}$

Write two equivalent fractions for  $\frac{6}{8}$ .     $\frac{6}{8} = \frac{\boxed{3}}{\boxed{4}} = \frac{\boxed{18}}{\boxed{24}}$

Draw a fraction model to show that  $\frac{1}{4}$  and  $\frac{2}{8}$  are equivalent.    **Answer:** 

Draw a fraction model to show that  $\frac{1}{3}$  and  $\frac{2}{6}$  are equivalent.    **Answer:** 

## Concept Mastery

- ✓ Students are able to explain why two fractions are equivalent using fraction models, number lines, and/or manipulatives.
- ✓ Students know that equivalent fractions can be created by multiplying the numerator and the denominator by the same number.

**A link to helpful web resources  
can be found on page 118 of the  
full Level 4 document.**

